



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2012-0260; Notice No. 25-12-05-SC]

Special Conditions: Embraer S.A. Model EMB-550 airplanes, sudden engine stoppage

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed special conditions.

SUMMARY: This action proposes special conditions for the Embraer Model EMB-550 airplane.

This airplane will have a novel or unusual design feature associated with the effects of sudden engine stoppage upon the airframe. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These proposed special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: Submit your comments on or before [insert date 30 days after FR publication].

ADDRESSES: Send comments identified by docket number FAA-2011-0260 using any of the following methods:

- Federal eRegulations Portal: Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.
- Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.

- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 8 a.m. and 5 p.m., Monday through Friday, except federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.

FOR FURTHER INFORMATION CONTACT: Cindy Ashforth, FAA, International Branch, ANM-116, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone (425) 227-2768; facsimile (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive on or before the closing date for comments.

We may change these special conditions based on the comments we receive.

Background

On May 14, 2009, Embraer applied for a type certificate for their new Model EMB-550 airplane. The Model EMB-550 airplane is the first of a new family of jets designed as a corporate jet, and for fractional, charter, and private-owner operations. The airplane is a conventional configuration with a low wing and T-tail empennage. The primary structure is metal with composite empennage and control surfaces. The Model EMB-550 airplane is designed for eight passengers, with a maximum of 12 passengers (including toilet seat). It is equipped with two Honeywell HTF7500-E medium-bypass-ratio turbofan jet engines mounted on aft-fuselage pylons. Each engine produces approximately 6,540 lb of thrust for normal takeoff. The primary flight-control systems are electronically controlled using fly-by-wire (FBW) technology.

The Model EMB-550 airplane incorporates novel or unusual design features involving engine size and torque load that affect the airframe as it relates to sudden engine-stoppage conditions.

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, Embraer must show that the Model EMB-550 airplane meets the applicable provisions of part 25, as amended by Amendments 25-1 through 1-127.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model EMB-550 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, the special conditions would also apply to the other model.

In addition to the applicable airworthiness regulations and special conditions, the Model EMB-550 airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34 and the noise-certification requirements of 14 CFR part 36; and the FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the “Noise Control Act of 1972.”

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type-certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Model EMB-550 airplane will incorporate the following novel or unusual design features:

The engine proposed for the Embraer Model EMB-550 airplane is a medium-bypass-ratio turbofan jet engine that will not seize and produce transient torque loads in the same manner that is envisioned by current § 25.361(b)(1) related to “sudden engine stoppage.”

Discussion

The limit engine torque load imposed by sudden engine stoppage due to malfunction or structural failure (such as compressor jamming) has been a specific requirement for transport-category airplanes since 1957. In the past, the design torque loads associated with typical failure scenarios have been estimated by the engine manufacturer and provided to the airframe manufacturer as limit loads. These limit loads were considered simple, purely static torque loads. The size, configuration, and failure modes of jet engines have changed considerably from what was envisioned when the engine-seizure requirement of § 25.361(b) was first adopted. Current engines are much larger and are now designed with large bypass fans capable of producing much larger torque loads if they become jammed.

Relative to the engine configurations that existed when the rule was developed in 1957, the present generation of engines are sufficiently different and novel to justify issuance of special conditions to establish appropriate design standards. The latest generations of jet engines are capable of producing, during failure, transient loads that are significantly higher and more complex than the generation of engines that were present when the existing standard was developed. Therefore, the FAA has determined that special conditions are needed for the Embraer Model EMB-550 airplane.

To maintain the level of safety envisioned in § 25.361(b), more comprehensive criteria are needed for the new generation of high-bypass engines. The special conditions would

distinguish between the more common engine-failure events and those rare events resulting from structural failures. For these less common but more severe seizure events, the criteria (as stated in special conditions numbers 3 and 4, below) could allow some deformation in the engine-supporting structure (ultimate load design) to absorb the higher energy associated with the high-bypass engines, while at the same time protecting the adjacent primary structure in the wing and fuselage by providing a higher safety factor. The criteria for the more-severe events would no longer be a purely static torque-load condition, but would account for the full spectrum of transient dynamic loads developed from the engine-failure condition.

Applicability

As discussed above, these special conditions are applicable to the Model EMB-550 airplane. Should Embraer apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on one model of airplane. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Proposed Special Conditions

Accordingly, the Federal Aviation Administration (FAA) proposes the following special conditions as part of the type-certification basis for the Embraer Model EMB-550 airplane.

In lieu of 14 CFR 25.361(b), the following special conditions are proposed:

1. For turbine-engine installations, the engine mounts, pylons, and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
 - (a) Sudden engine deceleration due to a malfunction that could result in a temporary loss of power or thrust, and
 - (b) The maximum acceleration of the engine.
2. For auxiliary power unit (APU) installations, the APU mounts and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
 - (a) Sudden APU deceleration due to malfunction or structural failure; and
 - (b) The maximum acceleration of the APU.
3. For engine-supporting structure, an ultimate loading condition must be considered that combines 1g flight loads with the transient dynamic loads resulting from:
 - (a) The loss of any fan, compressor, or turbine blade; and separately
 - (b) Where applicable to a specific engine design, any other engine structural failure that results in higher loads.

4. The ultimate loads developed from the conditions specified in paragraphs 3(a) and 3(b) are to be multiplied by a factor of 1.0 when applied to engine mounts and pylons, and multiplied by a factor of 1.25 when applied to adjacent supporting airframe structure.
5. Any permanent deformation that results from the conditions specified in Special Condition 3, above, must not prevent continued safe flight and landing.

Issued in Renton, Washington, on September 6, 2012.

Ali Bahrami
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Aircraft Certification Service

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